

<b>Prüfbericht-Nr.:</b> <i>Test report no.:</i>	<b>CN21UQOM 003</b>	<b>Auftrags-Nr.:</b> <i>Order no.:</i>	<b>168316899</b>	Seite 1 von 19 Page 1 of 19
<b>Kunden-Referenz-Nr.:</b> <i>Client reference no.:</i>	<b>N/A</b>	<b>Auftragsdatum:</b> <i>Order date:</i>	<b>2021-05-10</b>	
<b>Auftraggeber:</b> <i>Client:</i>	Telit Communications S.p.A., Viale Stazione di Prosecco 5/b, 34010, Trieste, Italy			
<b>Prüfgegenstand:</b> <i>Test item:</i>	Data Terminal Module			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type no.:</i>	ML865G1-WW			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	Test Report			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	47 CFR FCC Part 22 47 CFR FCC Part 24 47 CFR FCC Part 2	RSS-132 Issue 3 RSS-133 Issue 6 RSS-Gen Issue 5		
<b>Wareneingangsdatum:</b> <i>Date of sample receipt:</i>	2021-05-18	Refer to Photo Documentation		
<b>Prüfmuster-Nr.:</b> <i>Test sample no.:</i>	A003047853-001, A003047853-002, A003047853-003			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	2021-05-18 – 2021-06-23			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass			
<b>geprüft von:</b> <i>tested by:</i>	<input checked="" type="checkbox"/> <u>Hardy Suo</u>	<b>genehmigt von:</b> <i>authorized by:</i>	<input checked="" type="checkbox"/> <u>Sam Lin</u>	
<b>Datum:</b> <i>Date:</i>	2021-07-22	<b>Ausstellungsdatum:</b> <i>Issue date:</i>	2021-07-22	
<b>Stellung / Position:</b>	<b>Sachverständige(r)/Expert</b>	<b>Stellung / Position:</b>	<b>Sachverständige(r)/Expert</b>	
<b>Sonstiges / Other:</b>	FCC ID: RI7ML865G1WW; IC: 5131A-ML865G1WW This report is for GPRS/EGPRS operation.			
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
<b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

v05

## TEST SUMMARY

### 5.1.1 RF POWER OUTPUT

RESULT: Pass

### 5.1.2 OCCUPIED BANDWIDTH AND 26DB BANDWIDTH

RESULT: Pass

### 5.1.3 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

RESULT: Pass

### 5.1.4 SPURIOUS EMISSIONS AT ANTENNA TERMINALS – BAND EDGE

RESULT: Pass

### 5.1.5 FIELD STRENGTH OF SPURIOUS RADIATION

RESULT: Pass

### 5.1.6 FREQUENCY STABILITY

RESULT: Pass

### 5.1.7 PEAK TO AVERAGE RATIO

RESULT: Pass

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## 1. GENERAL REMARKS

### 1.1 COMPLEMENTARY MATERIALS

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Test Results of GSM operation

Appendix B: Test Results of Field Strength of Spurious Radiation

Appendix C: Photographs of the Test Set-Up

### 1.2 TEST STANDARD(S)

Applied Rules:	47 CFR FCC Part 22	RSS-132 Issue 3
	47 CFR FCC Part 24	RSS-133 Issue 6
	47 CFR FCC Part 2	RSS-Gen Issue 5
Test Method:	KDB 971168 D01	
	ANSI C63.26	

### 1.3 List of Document Change

No.	Report No.	Description
1	CN21UQOM 003	First release.

## 2. TEST SITES

### 2.1 TEST FACILITIES

TÜV Rheinland (Shenzhen) Co., Ltd.

(FCC Registration No.: 694916 & IC Registration Number: 25069)

Address: No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, P.R. China

### 2.2 TEST DATE

Date of test: 2021-05-18 - 2021-06-23

### 2.3 LIST OF TEST AND MEASUREMENT INSTRUMENTS

**Table 1: List of Test and Measurement Equipment**

Description	Manufacturer	Model	Serial No.	Calibrated until (DD.MM.YYYY)
<b>Radio Spectrum Testing</b>				
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	166305	20.09.2021
Signal Analyzer	Rohde & Schwarz	FSV 40	101475	20.09.2021
Vector Signal Generator	Rohde & Schwarz	SMBV100A	263466	20.09.2021
Signal Generator	Rohde & Schwarz	SMB100A	181041	17.12.2021
High Speed Power Supply	KEITHLEY	2303	4080052	17.12.2021
RF Control Unit	Tonscend	JS0806-1	19H8060192	N/A
<b>Field Strength of Spurious Radiation</b>				
EMI Test Receiver	Rohde & Schwarz	ESR 7	102021	11.08.2021
Signal Analyzer	Rohde & Schwarz	FSV 40	101439	10.08.2021
System Controller Interface	Rohde & Schwarz	SCI-100	S10010038	N/A
OSP	Rohde & Schwarz	OSP 120	102040	N/A
Pre-amplifier	Rohde & Schwarz	SCU08F1	08320031	10.08.2021
Amplifier	Rohde & Schwarz	SCU-18F	180070	10.08.2021
Amplifier	Rohde & Schwarz	SCU40A	100475	10.09.2021
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	08.08.2022

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Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	08.08.2022
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	08.08.2022
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	13.09.2022
Wideband Ridged Horn Antenna (12-18 GHz)	Steatite	QMS-00208	18313	02.09.2021
Test software	Rohde & Schwarz	EMC32 (V10.60.10)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A

## 2.4 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

## 2.5 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

## 2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

## 2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. facility located at No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, P.R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

### 3. GENERAL PRODUCT INFORMATION

#### 3.1 GENERAL DESCRIPTION

The EUT is wireless module which supports GPRS/EGPRS, NB-IoT and eMTC wireless technology. For details refer to the User Manual, Technical Description and Circuit Diagram.

#### 3.2 RATING AND SYSTEM DETAILS

**Table 2: Rating of EUT**

General Information of EUT	Description
Kind of Equipment:	Data Terminal Module
Type Designation:	ML865G1-WW
FCC ID:	RI7ML865G1WW
IC:	5131A-ML865G1WW
Hardware Version:	0.0
Software Version:	M0C.500003
Type of Equipment:	Single Module
Antenna:	External Antenna
Operating Voltage:	DC 3.8V
Operating Temperature Range:	-40°C ~ +85°C

**Table 3: Technical Specification of EUT**

Characteristic	Description
Operated Modes:	GPRS, EGPRS
Operational Frequency Band(s):	GSM 850, PCS 1900
Nominal RF Output Power:	GPRS 850: 33 dBm ± 2dB GPRS 1900: 30 dBm ± 2dB EGPRS 850: 27 dBm ± 2dB EGPRS 1900: 26 dBm ± 2dB
Power Class:	GPRS 850: Class 4 GPRS 1900: Class 1 EGPRS 850: Class E2 EGPRS 1900: Class E2
Modulation Type:	GMSK(GPRS/EGPRS), 8PSK(EGPRS)
Antenna Type:	External Antenna The EUT doesn't have antenna, The adapter and antenna used for testing in this report is the after-market accessory
Antenna Gain:	2.14 dBi
Extreme Voltage:	DC 3.2 ~ 4.5V
Extreme Temperature:	-40 ~ +85 °C



**Table 4: Operating Frequency Range and Channel Bandwidth of EUT**

Frequency Band(s)	Frequency Range	
	Transmitting $f_{UL}$ (MHz)	Receiving $f_{DL}$ (MHz)
GSM 850	824 ~ 849	869 ~ 894
PCS 1900	1850 ~ 1910	1930 ~ 1990

### 3.3 INDEPENDENT OPERATION MODES

The basic operation modes are:

- A. On, communication link established, Transmitting
  - 1) GPRS/EGPRS GMSK operating
    - i. Low channel
    - ii. Middle channel
    - iii. High channel
  - 2) EGPRS 8PSK operating
    - i. Low channel
    - ii. Middle channel
    - iii. High channel
- B. On, communication link established, Receiving
  - 1) GPRS/EGPRS operating
- C. Idle
- D. Off

### 3.4 NOISE GENERATING AND NOISE SUPPRESSING PARTS

Refer to the Circuit Diagram.

### 3.5 SUBMITTED DOCUMENTS

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> User Manual     | <input checked="" type="checkbox"/> Rating Label   |
| <input checked="" type="checkbox"/> Circuit Diagram | <input checked="" type="checkbox"/> PCB Layout     |
| <input checked="" type="checkbox"/> Block Diagram   | <input checked="" type="checkbox"/> Photo Document |
| <input checked="" type="checkbox"/> Schematics      | <input checked="" type="checkbox"/> Parts List     |

## 4. TEST SET-UP AND OPERATION MODES

### 4.1 Principle of Configuration Selection

**Radio Spectrum:** The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

### 4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedure in KDB 971168 D01 and ANSI C63.26.

**Table 5: List of Frequencies under Test**

Operation bands	TX/RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM 850	TX	Channel 128	Channel 190	Channel 251
		824.2MHz	836.6MHz	848.8MHz
	RX	Channel 128	Channel 190	Channel 251
		869.2MHz	881.6MHz	893.8MHz
PCS 1900	TX	Channel 512	Channel 661	Channel 810
		1850.2MHz	1880.0MHz	1909.8MHz
	RX	Channel 512	Channel 661	Channel 810
		1930.2MHz	1960.0MHz	1989.8MHz

**Table 6: Test Environments**

Environment Parameter	Selected Values During Tests		
	Temperature (°C)	Voltage (V) DC	Relative Humidity (%)
Normal (NTNV)	24	3.8	51%
HTHV	85 °C	4.5	---
LTHV	-40 °C	4.5	---
HTLV	85 °C	3.2	---
LTLV	-40 °C	3.2	---

**Table 7: Test Configurations**

Frequency Bands	Modulation	
	GMSK	8PSK
GSM 850/PCS1900 GPRS	Δ	-
GSM 850/PCS1900 EGPRS	Δ	Δ

### 4.3 Special Accessories and Auxiliary Equipment

**Table 8: Cables used during test**

Port	Quantity	Length (m)	Connector	Type of Cable
USB	1	1.2	USB	USB cable, shielding

**Table 9: Auxiliary Equipment used during test**

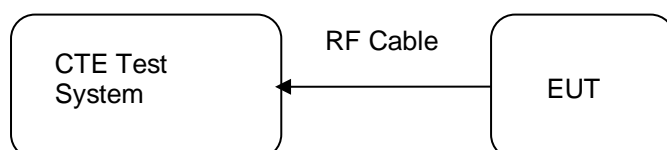
Name	Model	Manufacturer	S/N
Evaluation Kit	EVK2	Telit	N/A
LTE Magnetic Antenna	T-AT305 Frequency Range: 700-960 MHz / 1710- 2700 MHz Omnidirectional antenna Gain: 2.14 dBi (Max.) Cable: RG 174mm 2500	ATEL-CAB	N/A

### 4.4 Countermeasures to achieve EMC Compliance

The test sample, which has been tested, contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

### 4.5 Test Setup Diagram

Diagram of Measurement Equipment Configuration for Transmitter Conducted Measurement



## 5. TEST RESULTS

### 5.1 ESSENTIAL REQUIREMENTS

#### 5.1.1 RF POWER OUTPUT

**RESULT:** **Pass**

Test standard	:	47 CFR FCC Part 22	RSS-132 Issue 3	
		47 CFR FCC Part 24	RSS-133 Issue 6	
		47 CFR FCC Part 2	RSS-Gen Issue 5	
Limits	:	Operating band	FCC Limit	ISED Limit
		GSM 850	ERP 7 watts	ERP 11.5 watts
		PCS 1900	EIRP 2 watts	EIRP 2 watts
Test procedure	:	Clause 5.2.4.2 of ANSI C63.26		
Kind of test site	:	Shielding Room		

#### TEST SETUP

Date of testing	:	2021-05-18 - 2021-06-23
Input voltage	:	DC 3.8V
Test environment	:	<input checked="" type="checkbox"/> Normal test conditions <input type="checkbox"/> Extreme test conditions
Operation mode	:	A
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_{\text{T}}$$

where

ERP or EIRP: effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as  $P_{\text{Meas}}$ , e.g. dBm)

$P_{\text{Meas}}$ : measured transmitter output power, in dBm

$G_{\text{T}}$ : gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

Refer to attached Appendix A for details of test results.

**5.1.2 OCCUPIED BANDWIDTH AND 26DB BANDWIDTH****RESULT:****Pass**

Test standard	:	47 CFR FCC Part 22	RSS-132 Issue 3
		47 CFR FCC Part 24	RSS-133 Issue 6
		47 CFR FCC Part 2	RSS-Gen Issue 5
Test requirement	:	Section 2.1049 of 47 CFR FCC Part 2 Clause 6.7 of RSS-Gen Issue 5	
Limits	:	No limit	
Test procedure	:	Section 5.4.3 of ANSI C63.26 <input checked="" type="checkbox"/> Conducted measurements <input type="checkbox"/> Radiated measurements	
Kind of test site	:	Shielding Room	

**TEST SETUP**

Date of testing	:	2021-05-18 - 2021-06-23	
Input voltage	:	DC 3.8V	
Test environment	:	<input checked="" type="checkbox"/> Normal test conditions <input type="checkbox"/> Extreme test conditions	
Operation mode	:	A	
Ambient temperature	:	24 °C	
Relative humidity	:	51%	
Atmospheric pressure	:	101.0 kPa	

Refer to attached Appendix A for details of test results.

### 5.1.3 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

**RESULT:** **Pass**

Test standard	:	47 CFR FCC Part 22	RSS-132 Issue 3	
		47 CFR FCC Part 24	RSS-133 Issue 6	
		47 CFR FCC Part 2	RSS-Gen Issue 5	
Limits	:	Operating band	FCC Limit	ISED Limit
		PCS 1900	< - 13 dBm /1MHz	< - 13 dBm /1MHz
			< - 13 dBm /100kHz	< - 13 dBm / 100 kHz
		GSM 850	@ < 1GHz	
			< - 13 dBm /1MHz	
			@ > 1GHz	
Test procedure	:	Clause 5.7.4 of ANSI C63.26		
Kind of test site	:	Shielding Room		

#### TEST SETUP

Date of testing	:	2021-05-18 - 2021-06-23
Input voltage	:	DC 3.8V
Test environment	:	<input checked="" type="checkbox"/> Normal test conditions
		<input type="checkbox"/> Extreme test conditions
Operation mode	:	A
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

The limit calculation:

$$\text{Limit} = P_{\text{Meas}} \text{ (dBm)} - [43 + 10 \log(P_{\text{Meas}})] = -13 \text{ dBm}$$

Refer to attached Appendix A for details of test results.

### 5.1.4 SPURIOUS EMISSIONS AT ANTENNA TERMINALS – BAND EDGE

**RESULT:** **Pass**

Test standard	:	47 CFR FCC Part 22	RSS-132 Issue 3	
		47 CFR FCC Part 24	RSS-133 Issue 6	
		47 CFR FCC Part 2	RSS-Gen Issue 5	
Limits	:	Operating band	FCC Limit	ISED Limit
		PCS 1900	< - 13 dBm /1%EBW	< - 13 dBm / 1%OBW
		GSM 850	< - 13 dBm /1%EBW	< - 13 dBm / 1%OBW
Test procedure	:	Clause 5.7.3 of ANSI C63.26		
Kind of test site	:	Shielding Room		

**TEST SETUP**

Date of testing	:	2021-05-18 - 2021-06-23
Input voltage	:	DC 3.8V
Test environment	:	<input checked="" type="checkbox"/> Normal test conditions <input type="checkbox"/> Extreme test conditions
Operation mode	:	A
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

The limit calculation:

$$\text{Limit} = P_{\text{Meas}} \text{ (dBm)} - [43+10\log(P_{\text{Meas}})] = -13 \text{ dBm}$$

$$\text{Limit} = P_{\text{Meas}} \text{ (dBm)} - [50+10\log(P_{\text{Meas}})] = -20 \text{ dBm}$$

Refer to attached Appendix A for details of test results.

### 5.1.5 FIELD STRENGTH OF SPURIOUS RADIATION

**RESULT:**
**Pass**

Test standard	:	47 CFR FCC Part 22	RSS-132 Issue 3
		47 CFR FCC Part 24	RSS-133 Issue 6
		47 CFR FCC Part 2	RSS-Gen Issue 5
Limits	:	Operating band	FCC Limit
			ISED Limit
		PCS 1900	< - 13 dBm /1MHz
		GSM 850	< - 13 dBm /100kHz @ < 1GHz
			< - 13 dBm / 100 kHz
			< - 13 dBm /1MHz @ > 1GHz
Test procedure	:	Clause 5.5 of ANSI C63.26	
Kind of test site	:	3m Semi Anechoic Room	

**TEST SETUP**

Date of testing	:	2021-05-18 - 2021-06-23
Input voltage	:	DC 3.8V
Test environment	:	<input checked="" type="checkbox"/> Normal test conditions
		<input type="checkbox"/> Extreme test conditions
Operation mode	:	A
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

The limit calculation:

$$\text{Limit} = P_{\text{Meas}} (\text{dBm}) - [43 + 10 \log(P_{\text{Meas}})] = -13 \text{ dBm}$$

Sweep the whole frequency band through the range from 9 kHz to the 10<sup>th</sup> harmonic of the carrier, the emissions below the noise floor will not be recorded in this report. The measurement is performed for all operational modes and both antenna polarization, only the data of the worst mode is recorded in this report.

Refer to attached Appendix B for details of test results.



## 5.1.6 FREQUENCY STABILITY

**RESULT:****Pass**

Test standard	:	47 CFR FCC Part 22	RSS-132 Issue 3	
		47 CFR FCC Part 24	RSS-133 Issue 6	
		47 CFR FCC Part 2	RSS-Gen Issue 5	
Limits	:	Operating band	FCC Limit	ISED Limit
		PCS 1900	Within authorized bands	2.5 ppm
		GSM 850	2.5 ppm	2.5 ppm
Test procedure	:	Clause 5.6.3 of ANSI C63.26		
Kind of test site	:	Shielding Room		

**TEST SETUP**

Date of testing	:	2021-05-18 - 2021-06-23
Input voltage	:	DC 3.8V
Test environment	:	<input checked="" type="checkbox"/> Normal test conditions <input checked="" type="checkbox"/> Extreme test conditions
Operation mode	:	A
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

Refer to attached Appendix A for details of test results.

### 5.1.7 PEAK TO AVERAGE RATIO

**RESULT:****Pass**

Test standard	:	47 CFR FCC Part 22	RSS-132 Issue 3	
		47 CFR FCC Part 24	RSS-133 Issue 6	
		47 CFR FCC Part 2	RSS-Gen Issue 5	
Limits	:	Operating band	FCC Limit	ISED Limit
		PCS 1900	PAR ≤ 13 dB	PAR ≤ 13 dB
		GSM 850	PAR ≤ 13 dB	PAR ≤ 13 dB
Test procedure	:	Clause 5.2.6 of ANSI C63.26		
Kind of test site	:	Shielding Room		

**TEST SETUP**

Date of testing	:	2021-05-18 - 2021-06-23
Input voltage	:	DC 3.8V
Test environment	:	<input checked="" type="checkbox"/> Normal test conditions <input type="checkbox"/> Extreme test conditions
Operation mode	:	A
Ambient temperature	:	24 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

Refer to attached Appendix A for details of test results.

## 6. SYSTEM MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

**Table 10: System Measurement Uncertainty**

Items		Extended Uncertainty
RE	Radiated emission 9 kHz - 30 MHz	±3.97 dB
	Radiated emission 30 MHz - 1 GHz	±4.30 dB
Remark: 95% Confidence Levels, K=2.		

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